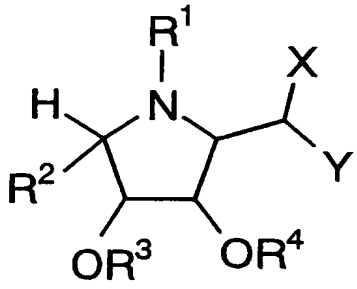
Claims

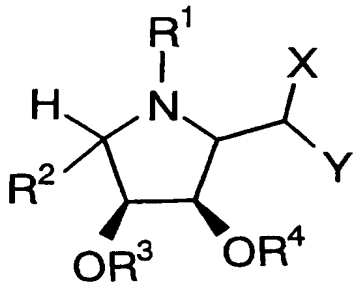
1. A compound represented by the formula (I) or a salt thereof:



(I)

wherein R^1 represents a hydrogen atom, a C_{1-10} alkyl group optionally having a substituent, or a protecting group of N; R^2 represents a C_{1-10} alkyl group optionally having a substituent or a C_{2-10} alkenyl group optionally having a substituent; R^3 and R^4 independently represent a hydrogen atom or a protecting group of hydroxyl group; X represents $-N(R^5)R^6$ or a residue of amino acid or of an amino group of a peptide wherein R^5 and R^6 independently represent a hydrogen atom, a C_{1-10} alkyl group optionally having a substituent, or a C_{3-12} cycloalkyl group optionally having a substituent; and Y represents a hydrogen atom, $-CH_2NH_2$, $-CONH_2$, or -COOH.

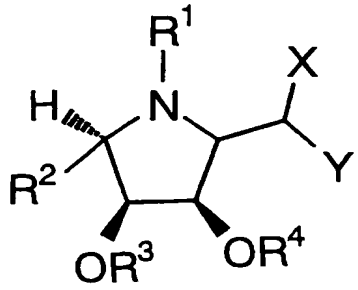
2. The compound according to claim 1 or a salt thereof, wherein the configuration of the formula (I) is represented by the following formula (Ia):



(Ia)

wherein R^1, R^2, R^3, R^4, X, and Y are as defined in claim 1.

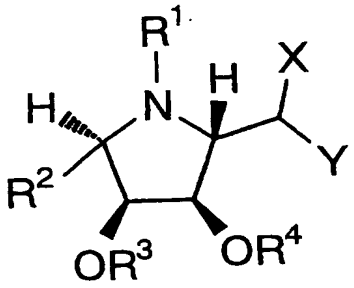
3. The compound according to claim 1 or a salt thereof, wherein the configuration of the formula (I) is represented by the following formula (Ib):



(Ib)

wherein R^1, R^2, R^3, R^4, X, and Y are as defined in claim 1.

4. The compound according to claim 1 or a salt thereof, wherein the configuration of the formula (I) is represented by the following formula (Ic):



(Ic)

wherein R^1, R^2, R^3, R^4, X, and Y are as defined in claim 1.

5. The compound according to any one of claims 1 to 4 or a salt thereof, wherein R^2 represents $-CH_2OR^{12}$ wherein R^{12} represents a hydrogen atom or a protecting group of hydroxyl group.

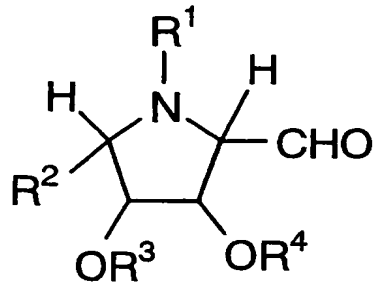
6. An inhibitor of sugar chain related enzymes which comprises the compound of any of claims 1 to 5 or a salt thereof.

7. A medicine which comprises, as an active ingredient, the compound of any of claims 1 to 5 or a salt thereof.

8. The medicine according to claim 7 which is a medicine for the therapy or prevention of diseases associated with sugar chain related enzymes.

9. The medicine according to claim 7 or 8 which is used as an antiviral agent, an anticancer agent, or an immunostimulant agent.

10. A method for producing a compound represented by the formula (I) according to claim 1 which comprises a step of reacting a compound represented by the formula (II):



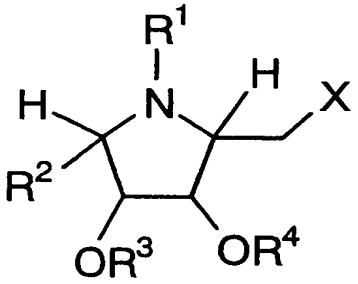
(II)

wherein R^1 represents a hydrogen atom, a C_{1-10} alkyl group optionally having a substituent, or a protecting group of N; R^2 represents a C_{1-10} alkyl group optionally having a substituent or a C_{2-10} alkenyl optionally having a substituent; and R^3 and R^4 independently represent a hydrogen atom or a protecting group of hydroxyl group;

with a compound represented by the formula X-H:

wherein X represents $-N(R^5)R^6$ or a residue of amino acid or of an amino group of a peptide, and R^5 and R^6 independently represent a hydrogen atom, a C_{1-10} alkyl group optionally having a substituent, or a C_{3-12} cycloalkyl group optionally having a substituent;

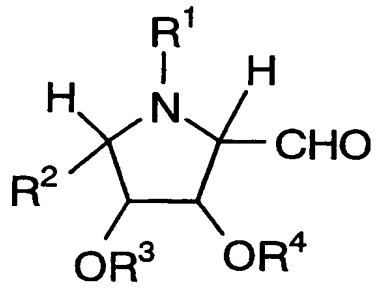
in the presence of a reducing agent, to produce a compound represented by the formula (III):



(III)

wherein R^1, R^2, R^3, R^4 and X are as defined above.

11. A method for producing a compound represented by the formula (I) according to claim 1 which comprises a step of reacting a compound represented by the formula (II):



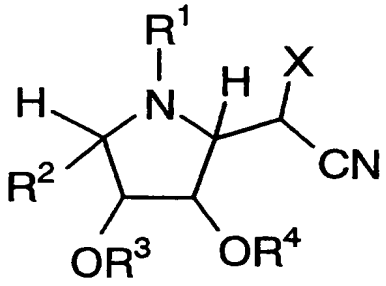
(II)

wherein R^1 represents a hydrogen atom, a C_{1-10} alkyl group optionally having a substituent, or a protecting group of N; R^2 represents a C_{1-10} alkyl group optionally having a substituent or a C_{2-10} alkenyl optionally having a substituent; and R^3 and R^4 independently represent a hydrogen atom or a protecting group of hydroxyl group;

with a compound represented by the formula X-H:

wherein X represents $-N(R^5)R^6$ or a residue of amino acid or of an amino group of a peptide, and R^5 and R^6 independently represent a hydrogen atom, a C_{1-10} alkyl group optionally having a substituent, or a C_{3-12} cycloalkyl group optionally having a substituent;

and a cyanation agent in the presence of Lewis acid, to produce a compound represented by the formula (IV):



(IV)

wherein R^1, R^2, R^3, R^4 and X are as defined above.